

October 27, 2020

Brett Middleton  
Lead EHS Specialist  
Caerus Oil & Gas, LLC  
143 Diamond Avenue  
Parachute, Colorado 81635

**RE: Request for Relief from Condition of Approval  
Riley 1  
Project Remediation Number 9490  
Garfield County, Colorado**

Mr. Middleton:

At your request, LT Environmental, Inc. (LTE) has prepared this letter for Caerus Oil & Gas, LLC (Caerus) to request relief from the Condition of Approval (COA) attached to Colorado Oil and Gas Conservation Commission (COGCC) Supplemental Form 27 Document Number 401721776. The release was initially reported by Petroleum Development Corporation (PDC) on December 10, 2009, under Spill Release Tracking Number 2606677 and Remediation Number 5224. When the asset transferred operators, Remediation Number 9490 was created (Referenced under COGCC Document Number 200438983) and the previous Remediation Number 5224 was closed.

LTE recommends Caerus request relief from the following COA attached to COGCC Supplemental Form 27 Document Number 401721776:

*Based upon review of the available information, the COGCC does not approve of the operator's request for No Further Action at this time. Additional information is required to address potential groundwater impacts.*

The request for relief is based on evidence provided below that benzene, toluene, ethylbenzene, and total xylenes (BTEX) impacts to groundwater at this location have been remediated into regulatory compliance.

#### **ASSESSMENT AND SAMPLING SUMMARY OF GROUNDWATER AT THE RILEY 1 (REM # 9490)**

Initial release characterization was completed by LTE from December 2009 through February 2010. A total of thirteen soil borings were advanced within the release footprint to delineate the impacted area. The soil borings were advanced to depths ranging from 30 feet to 37 feet below ground surface (bgs). Groundwater was observed at approximately 29 feet to 30 feet bgs in soil borings SB01 through SB07. Four of the soil borings (SB01 through SB04) were converted to groundwater monitoring wells with total depths ranging from 35 feet to 36 feet bgs. The

groundwater wells were developed and sampled for laboratory analysis of BTEX. Laboratory analytical results of the sample from SB01 exceeded the COGCC Concentration Level for benzene with a concentration of 5.09 micrograms per liter ( $\mu\text{g/L}$ ). Laboratory analytical results of SB04 were below the COGCC Concentration Levels for BTEX. Monitoring well locations SB02 and SB03 were confirmed dry. These assessment activities can be referenced in COGCC Form 27 Document Number 02211367 and under Spill/Release Tracking Number 2606677. The soil boring and monitoring well locations are depicted on the attached Figure 1. The analytical results are summarized in the attached Table 1.

In October 2011, Olsson & Associates continued remediation activities which included a series of *Cool-Ox™* injections within the subsurface of the source area (6 events). The *Cool-Ox™* was injected into the subsurface using 6.5 feet to 7 feet grid pattern within the source area. These injections were targeted both above the groundwater level (vadose zone) and below the groundwater level (phreatic surface) to a total depth of approximately 40 feet bgs. These remediation activities can be referenced in COGCC Form 27 Document Numbers 02211367 and 02211267.

During November 2011, June 2012, and November 2012, a total of 14 additional soil borings were advanced and soil confirmation samples were collected within the remediation area in order to monitor attenuation of the identified hydrocarbon impacts. Laboratory analytical results indicated total petroleum hydrocarbons (TPH) and benzene exceeded the COGCC Table 910-1 Concentration Levels at depths of 10 feet to 11.5 feet bgs. Additionally, laboratory analytical results indicated TPH and total xylenes exceeded the COGCC Table 910-1 Concentration Levels at 25 feet bgs. Based on the hydrocarbon impacts observed in the soil during the above-mentioned sampling events, *Cool-Ox™* injections were again completed within the source area in January 2013. No groundwater was reported to be observed during these above-mentioned attenuation sampling events. These remediation activities including figures and soil analytical data can be referenced in COGCC Form 27 Document Number 02211267.

In June 2013, one soil boring (BH 6) was advanced to monitor attenuation of the subsurface impacts following the January 2013 *Cool-Ox™* injections. During this soil sampling event groundwater was reported to be observed within soil boring BH 6 at approximately 31 feet bgs. Laboratory results indicated soil boring BH 6 exceeded the COGCC Table 910-1 Concentration Level for TPH at 15 feet and 25 feet bgs. Additionally, benzene exceeded the COGCC Table 910-1 Concentration Level at 25 feet bgs in soil boring BH 6. No groundwater samples were reported to be collected at the time. These remediation activities including figures and soil analytical data can be referenced in COGCC Form 27 Document Number 02211267.

In October 2014, HCSI Environmental Consultants (HRL) completed the installation of 27 passive soil vapor extraction (SVE) wells within the source area. The SVE wells were installed using a 6-foot grid pattern spacing between each boring location. These SVE wells were installed with ventilator turbines to promote in-situ volatilization and biodegradation of the remaining

impacted soil within the source area. During the advancement of each boring, soil samples were collected at five-foot intervals. The most impacted soil samples based on field screening techniques were submitted for laboratory analysis of TPH. Soil boring depths ranged from 10 feet to 30 feet bgs. Laboratory analytical results indicated eight samples exceeded the COGCC Table 910-1 Concentration Level for TPH at depths ranging from 6 feet to 8 feet bgs to 20 feet to 22 feet bgs. No groundwater was reported to be observed during the advancement of these soil borings; therefore, no grab groundwater samples were collected. These remediation activities and analytical data can be referenced in COGCC Form 27 Document Number 02211267. The SVE well locations are depicted on the attached Figure 1.

On October 13, 2016, LTE completed the advancement of five soil borings (BH-5 through BH-9) within the source area in order to monitor attenuation of known hydrocarbon impacts within the remediation area. Soil boring depths ranged from 27 feet to 36 feet bgs. Laboratory analytical results of soil samples indicated TPH, benzene, and total xylene concentrations above the COGCC Table 910-1 Concentration Levels in soil borings BH-05, BH-06, BH-07, and BH-09. Vertical delineation of these impacts was achieved in each soil boring at depths ranging from 25 feet to 36 feet bgs. No groundwater was observed during the advancement of these soil borings; therefore, no groundwater samples were collected. The five soil boring locations are depicted on the attached Figure 1. The analytical results are summarized in the attached Table 2.

From July 9 through 27, 2018, Caerus personnel completed the removal of all impacted soil from the source area via mechanical excavation. The total depth of the excavation was 30 feet bgs. During excavation activities no groundwater was observed. A total of seven sidewall and four bottom samples were collected from the open excavation. Excavation confirmation soil sample depths ranged from 8 feet to 30 feet bgs. Laboratory analytical results of all closure excavation confirmation samples indicate all samples were either below the laboratory detection limit or within the COGCC Table 910-1 Concentration Levels for TPH and BTEX. The excavation confirmation soil sampling locations are depicted on Figure 2. The analytical results are summarized in the attached Table 3.

## REQUEST FOR RELIEF

Through the timeline of remediation data presented above, groundwater has not been observed at the site since June 2013 during the attenuation soil monitoring post in-situ injections of *Cool-Ox™* (COGCC Document Number 02211267) in January of 2013.

From February 2010 through December 2011, a total of eight groundwater sampling events were completed at the site. Benzene has not been detected in groundwater since April 19, 2010 when it exceeded the COGCC Concentration Level in SB01 at a concentration of 10.9 µg/L. The detection was prior to the injection of *Cool-Ox™* and the removal of impacted source soil. Since April 19, 2010, SB-01 has been observed to be dry (4 events) or analytical results were below the laboratory detection limit for BTEX (2 events). When water was present to sample during 2010

and 2011, BTEX concentrations were either below the laboratory detection limit or within the COGCC Concentration Levels in SB02 through SB04. From September 22, 2010 through December 16, 2011, six consecutive quarters of groundwater monitoring were completed. During these events, all well locations were either reported below the laboratory detection limit or within the COGCC Concentration Levels for BTEX, or the monitoring wells were dry. In order to close remediation projects or to discontinue groundwater sampling activities, only four consecutive quarters of demonstrated compliance with COGCC Table 910-1 are necessary.

From October 2014 to October 2016, 32 soil borings were advanced within the source area up to 36 feet bgs. During the advancement of these borings, no groundwater was observed. Based on previous site investigation data, if groundwater was present at the site, it would have been observed in these borings. The soil analytical results from the above-mentioned drilling events can be referenced as an attachment to COGCC Form 27 Document Numbers 02211267 and 401721776.

Excavation activities of the source area were completed from July 9 through 27, 2018, per approval of the COGCC (Document Number 401684813). The excavation depth measured 30 feet bgs, which is within the vertical depth where groundwater has been historically observed at this location. No groundwater was observed during the excavation. Vertical and horizontal delineation of the identified hydrocarbon impacts has been demonstrated through laboratory analytical results of excavation confirmation samples. These closure excavation soil samples were within the COGCC Table 910-1 Concentration Levels for TPH and BTEX, indicating the removal of all impacted soil. The excavation analytical data and figures can be referenced as an attachment in COGCC Supplemental Form 27 Document Number 401721776.

These remediation activities outlined above have demonstrated groundwater is not present up to 36 feet bgs interval and the complete removal of impacted material is demonstrated through soil analytical results. Since June of 2013, 32 soil borings were advanced within the source area to depths of 36 feet bgs without groundwater being observed. Based on these data it appears the previously observed groundwater was perched or discontinuous, and has not been encountered during recent remediation or assessment activities. Alternatively, the groundwater could not be present due to multiple year drought conditions or other unknown external factors, but if it does return to the site there is no risk of impact because all source soil has been removed via excavation. The pathway for soil hydrocarbons to leach into groundwater is closed as no impacted soil remains. When groundwater was last detectable it was compliant with COGCC Table 910-1 Concentration Levels and this was prior to soil source removal.

Based on the data provided above, extensive source removal efforts, and thorough assessment activities, LTE is respectfully requesting closure on behalf of Caerus of Remediation Number 9490 and is requesting relief of COA attached COGCC Supplemental Form 27 Document Number 401721776.

Sincerely,

LT ENVIRONMENTAL, INC.



Dustin Held  
Project Geologist



Chris McKisson  
Western Slope Manager

Attachments:

Figure 1: Site Map

Figure 2: Excavation Site Map

Table 1: Groundwater Analytical Results

Table 2: Soil Analytical Results

Table 3: Excavation Soil Analytical Results

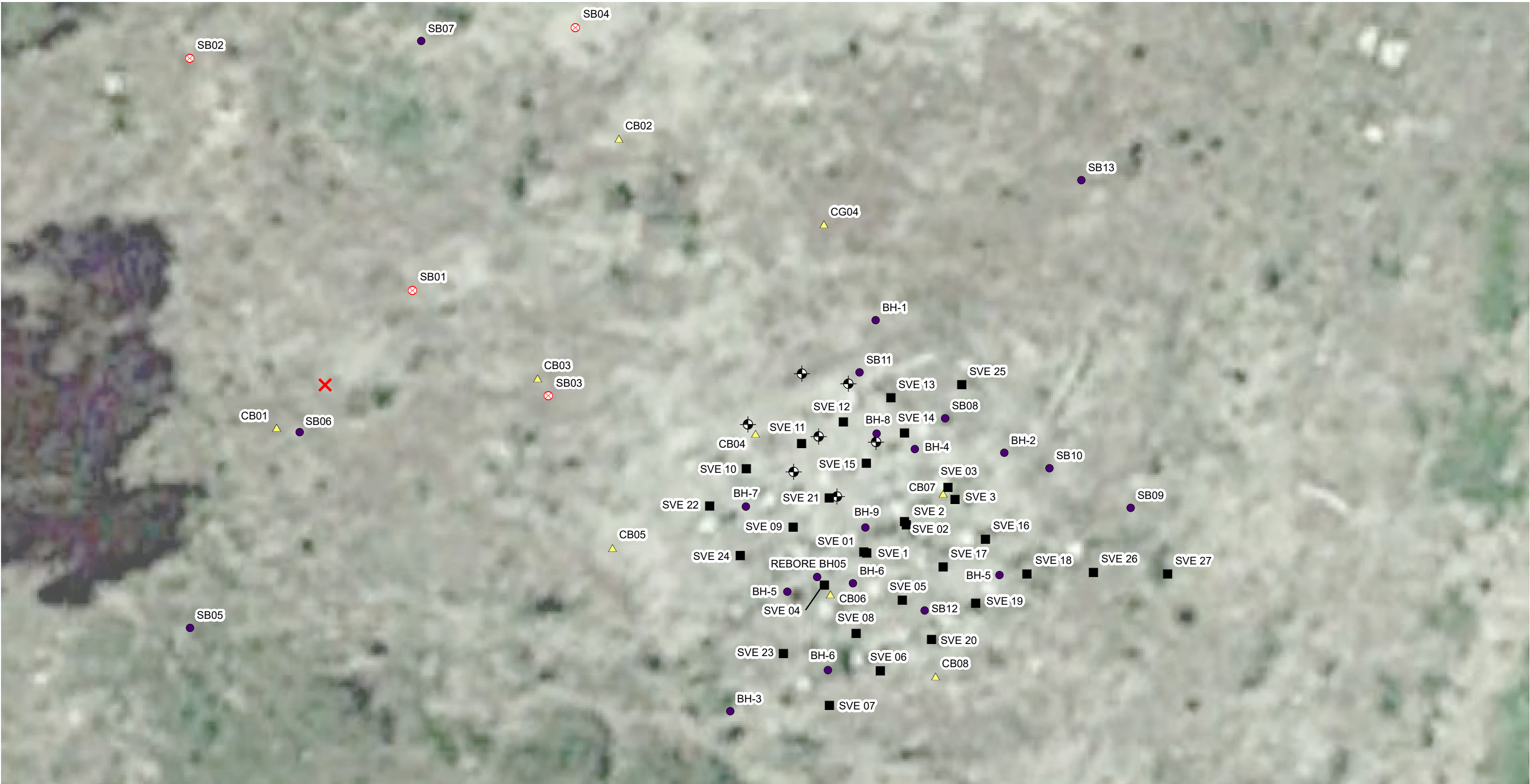








IMAGE COURTESY OF GOOGLE EARTH 2016

**LEGEND**

- |   |                  |   |                                  |
|---|------------------|---|----------------------------------|
|  | RELEASE LOCATION |  | SOIL VAPOR EXTRACTION (SVE) WELL |
|  | MONITORING WELL  |  | OLSON SAMPLE LOCATION            |
|  | SOIL BORING      |  | TREATMENT PORT                   |

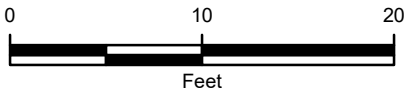


FIGURE 1  
SITE MAP  
RILEY #1  
NESW SEC 8 T7S R96W  
GARFIELD COUNTY, COLORADO  
CAERUS OIL AND GAS, LLC





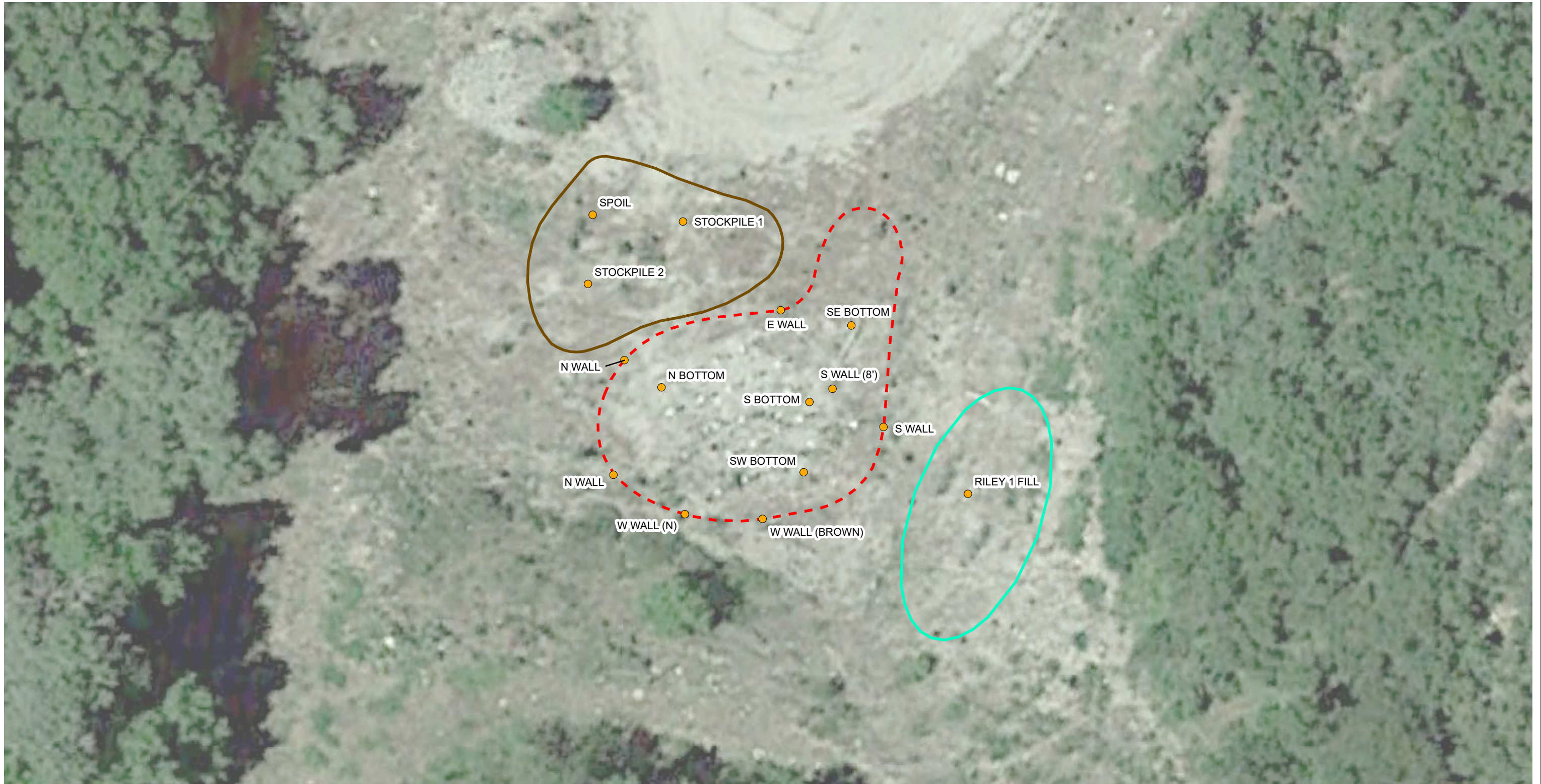


IMAGE COURTESY OF GOOGLE EARTH 2016

**LEGEND**

- SOIL SAMPLE
- EXCAVATION EXTENT
- SPOILS PILE
- FILL

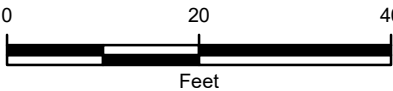


FIGURE 2  
EXCAVATION SITE MAP  
RILEY #1  
NESW SEC 8 T7S R96W  
GARFIELD COUNTY, COLORADO  
CAERUS OIL AND GAS, LLC

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of WSP



TABLE 1  
GROUNDWATER ANALYTICAL RESULTS  
RILEY 1 REMEDIATION  
CAERUS PICEANCE LLC  
PICEANCE BASIN, COLORADO

Sample ID	Date Sampled	Laboratory Analytical Results						
		Benzene	Toluene	Ethyl- benzene	Total Xylenes	TPH GRO	TPH DRO	
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	
COGCC - Groundwater Standards		0.005	0.56	0.7	1.4	NA	NA	
SB01	2/18/2010	0.00509	ND	0.00165	0.00205	NS	NS	
	4/19/2010	0.0109	0.0119	0.00076	0.0116	NS	NS	
	9/22/2010	dry	dry	dry	dry	dry	dry	
	12/10/2010	dry	dry	dry	dry	dry	dry	
	4/18/2011	ND	ND	ND	ND	ND	ND	
	6/22/2011	ND	ND	ND	ND	ND	0.100	
	9/29/2011	dry	dry	dry	dry	dry	dry	
	12/16/2011	dry	dry	dry	dry	dry	dry	
SB02	2/18/2010	ND	ND	ND	ND	NS	NS	
	9/22/2010	dry	dry	dry	dry	dry	dry	
	12/10/2010	dry	dry	dry	dry	dry	dry	
	4/18/2011	ND	ND	ND	ND	ND	ND	
	6/22/2011	ND	ND	ND	ND	ND	ND	
	9/29/2011	ND	ND	ND	ND	NS	NS	
	12/16/2011	dry	dry	dry	dry	dry	dry	
SB03	2/18/2010	ND	ND	ND	ND	NS	NS	
	9/22/2010	dry	dry	dry	dry	dry	dry	
	12/10/2010	dry	dry	dry	dry	dry	dry	
	4/18/2011	ND	ND	ND	ND	ND	ND	
	Duplicate	4/18/2011	ND	ND	ND	ND	ND	0.501
		6/22/2011	ND	ND	ND	ND	ND	ND
		9/29/2011	ND	ND	ND	ND	NS	NS
		12/16/2011	frozen	frozen	frozen	frozen	frozen	frozen
SB04	2/18/2010	0.00174	ND	0.00329	0.0104	NS	NS	
	9/22/2010	dry	dry	dry	dry	dry	dry	
	12/10/2010	dry	dry	dry	dry	dry	dry	
	4/18/2011	ND	ND	ND	ND	ND	ND	
	6/22/2011	ND	ND	ND	ND	ND	0.309	
	9/29/2011	dry	dry	dry	dry	dry	dry	
	12/16/2011	0.00054 J	0.0021	ND	ND	0.146	ND	

**NOTES:**

mg/L = milligrams per liter

**BOLD** = Exceeds COGCC Table 910-1 Concentration Level

COGCC = Colorado Oil and Gas Conservation Commission

J - indicates an estimated value

NA - COGCC does not have a standard

ND - analyte not detected above laboratory reporting limit

NS = not sampled

TPH GRO = total petroleum hydrocarbons gasoline range organics

TPH DRO = total petroleum hydrocarbons diesel range organics



TABLE 2  
RILEY 1  
SOIL ANALYTICAL RESULTS  
CAERUS OIL AND GAS  
PICEANCE BASIN, COLORADO

PARAMETER	COGCC CONCENTRATION LEVELS	UNITS	BH-5	BH-5	BH-6	BH-6	BH-7	BH-7	BH-8	BH-8	BH-9	BH-9
Sample Depth		Feet	10-12	25.5-27	20-22	25.5-27	20-22	32-34	10-12	30-32	5-7	34-36
Sample Date			10/13/2016	10/13/2016	10/13/2016	10/13/2016	10/13/2016	10/13/2016	10/13/2016	10/13/2016	10/13/2016	10/13/2016
Sample Type			Impacted Area	Clearance	Impacted Area	Clearance	Impacted Area	Clearance	Impacted Area	Clearance	Impacted Area	Clearance
Arsenic	0.39	mg/kg	12	23	16	23	16	16	13	16	11	17
Barium	15,000	mg/kg	220	290	210	310	160	240	310	310	250	550
Cadmium	70	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium (III)	120,000	mg/kg	11	13	12	14	11	14	14	13	13	12
Chromium (VI)	23	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	3,100	mg/kg	16	14	19	20	17	18	17	17	15	17
Lead	400	mg/kg	9.6	13	11	11	9.9	11	11	9.1	10	11
Mercury	23	mg/kg	ND	0.019	0.020	0.020	ND	0.024	ND	0.018	0.019	0.028
Nickel	1,600	mg/kg	18	18	23	24	18	22	18	18	17	20
Selenium	390	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	390	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	23,000	mg/kg	69	68	72	79	79	86	79	72	69	82
EC	4 or 2x background	mmhos/cm	3.2	1.2	5.7	1.0	0.90	1.7	5.9	1.4	3.1	1.4
pH	6-9	SU	8.1	8.2	8.3	7.8	8.2	8.1	8.3	8.1	8.3	8.2
SAR	12	unitless	6.1	2.2	1.0	2.2	1.9	2.0	7.0	1.9	8.5	1.8
TPH-DRO			1,500	10	500	10	130	7.9	50	8.3	2,200	7.9
TPH-GRO			3,300	ND	6,200	ND	930	ND	110	ND	6,900	ND
TPH	500	mg/kg	4,800	10	6,700	10	1,060	7.9	160	8.3	9,100	7.9
Benzene	0.17	mg/kg	ND	ND	ND	ND	0.11	ND	ND	ND	3.1	ND
Toluene	85	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	27	ND
Ethylbenzene	100	mg/kg	3.8	ND	9.8	ND	3.0	ND	0.15	ND	25	ND
Total Xylenes	175	mg/kg	36	ND	190	ND	40	ND	4.0	ND	540	ND
Acenaphthene	1,000	mg/kg	0.20	ND	ND	ND	ND	ND	ND	ND	0.11	ND
Anthracene	1,000	mg/kg	0.035	ND	ND	ND	ND	ND	ND	ND	0.10	ND
Benz(a)anthracene	0.22	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	0.22	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	2.2	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	0.022	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	22	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	0.022	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	1,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	1,000	mg/kg	0.23	ND	0.045	ND	0.011	ND	ND	ND	0.36	ND
Indeno(1,2,3,c,d)pyrene	0.22	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	23	mg/kg	2.4	ND	0.56	ND	0.36	ND	0.065	ND	5.1	ND
Pyrene	1,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	0.021	ND

Notes:

< - less than the stated reporting limit

Highlight - indicates result exceeds the COGCC concentration level

COGCC - Colorado Oil and Gas Conservation Commission

EC - electrical conductivity

mg/kg - milligrams per kilogram

mmhos/cm - millimhos per centimeter

NA - not analyzed

SAR - sodium adsorption ratio

SU - standard unit

TPH-GRO - total petroleum hydrocarbons-gasoline range organics

TPH-DRO - total petroleum hydrocarbons-diesel range organics

TPH - combination of TPH-GRO and TPH-DRO

**TABLE 3  
EXCAVATION SOIL ANALYTICAL RESULTS  
RILEY 1  
CAERUS OIL AND GAS LLC**

Location	Sample Date:	Sample Matrix	Matrix Notes	Organic Compounds in Soil (mg/kg [ppm])						
				Allowable Concentration --> 500			0.17	85	100	175
				TPH (total volatile and extractable petroleum hydrocarbons) (TPH-GRO + TPH-DRO)	TPH-GRO (C6-C10) Low Fraction	TPH-DRO (C10-C36) High Fraction	Benzene	Toluene	Ethylbenzene	Xylenes - total
Riley 1	07/16/18	Historical Release	SW Bottom (30')	<13.9	<7.7	<6.2	<0.030	<0.030	<0.030	<0.090
Riley 1	07/16/18	Historical Release	W Wall (N) (28')	4.5	<7.5	4.5	<0.030	<0.030	<0.030	<0.090
Riley 1	07/16/18	Historical Release	N Wall (28')	137	84	53	<0.030	<0.030	0.078	0.11
Riley 1	07/16/18	Historical Release	S Bottom (30')	466	430	36	<0.030	<0.030	0.62	7.1
Riley 1	07/16/18	Historical Release	S Wall (8')	2120	2000	120	0.54	<0.030	3.9	86
Riley 1	07/16/18	Historical Release	W Wall Brown Streak (20')	31	16	15	<0.049	<0.049	<0.049	<0.15
Riley 1	07/16/18	Historical Release	Spoil	859	830	29	<0.030	<0.030	1.1	37
Riley 1	07/18/18	Historical Release	Fill (3)	19	19	<6.0	<0.042	<0.042	<0.042	<0.13
Riley 1	07/18/18	Historical Release	Stock (1)	450	430	20	0.025	0.05	0.71	15
Riley 1	07/18/18	Historical Release	(N) Bot 30 (4)	338.5	330	8.5	<0.044	<0.044	0.32	1.6
Riley 1	07/18/18	Historical Release	(N) Wall 15 (5)	21	21	<6.2	<0.047	<0.047	<0.047	<0.14
Riley 1	07/18/18	Historical Release	(E) Wall 15 (6)	20	20	<5.8	<0.043	<0.043	<0.043	<0.13
Riley 1	07/18/18	Historical Release	(S) Wall 15 (7)	<13.5	<7.5	<6.0	<0.045	<0.045	<0.045	<0.14
Riley 1	07/18/18	Historical Release	(SE) Bot (8)	<13.5	<7.5	<6.0	<0.045	<0.045	<0.045	<0.14
Riley 1	07/18/18	Historical Release	Stock (9)	486	470	16	0.045	<0.043	1.2	20